

THE FIRST FIFTEEN YEARS

A BRIEF HISTORY (1987-2002)

OF THE CANADIAN ACADEMY OF ENGINEERING



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March 2004

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EXECUTIVE SUMMARY

The Canadian Academy of Engineering was established in June 1987 coincident with the centenary celebration of engineering in Canada. Beginning with 44 Founding Fellows, the membership has grown to the planned maximum of 250 professional engineers, elected on the basis of their distinguished careers, and of their service and contributions to society, to the country and to the engineering profession.

Over its brief 15-year history, the Academy has independently initiated several major studies, drawing on the expertise of its volunteer members. It has issued eight reports dealing with the engineering education, engineering research, the evolution of the engineering profession and other areas of direct importance to the nation. On several occasions the Academy has provided independent and expert advice on matters of national importance to governments and the public.

It has cooperated successfully with the Royal Society of Canada on a number of important issues such as health and safety, nuclear waste disposal and natural disaster reduction. Not without some difficulties, it has established itself as a parallel rather than a subsidiary academy. It has operated to complement the role and functions of existing national engineering organizations, providing leadership and advice in matters of general policy for the engineering profession. Because of its resource limitations, it has left implementation of these policies to others.

By joining and contributing to the international Council of Academies of Engineering and Technological Sciences, the Academy has established a good and workable link to the international engineering scene. That body has the potential, still largely unrealised, to have a major impact on world-level issues.

Much of the early work within the Academy has of necessity been directed toward developing its organization and raising funding to support its limited operations. The Academy has great potential in the wisdom, experience and insight of its Fellows. The success to date of the Academy in its objective of serving the nation in connection with significant challenges involving engineering and technology has to be assessed in relation to its very limited financial resources. Steps are currently being taken, together with other academies, to obtain government assistance for a more adequately supported infrastructure. The Academy has evolved to a stage where, with such support, it can play a more major role in enhancing the contribution of the engineering profession to the well being of Canada.

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BACKGROUND

There is no obvious starting point for an early history of the Canadian Academy of Engineering (CAE). Through the years leading up to 1987 a number of organizations have addressed and served various aspects of the profession of engineering in Canada.

The Royal Canadian Institute was founded in 1849 in Toronto by a group of architects, surveyors and engineers lead by Sir Sandford Fleming. This Institute soon lost its engineering emphasis, although it continues to sponsor public lectures on the sciences.

The Canadian Society of Civil Engineers was formed in 1887 and evolved into the Engineering Institute of Canada (EIC) in 1918. In the 1970s it was reorganized as an umbrella organization for a number of Canadian technical societies. Much of its activity is now focused on the coordination and quality control of continuing education for engineers.

The Association of Consulting Engineers of Canada (ACEC) was established in 1925 to promote and safeguard the business and professional interests of the Canadian consulting engineering industry in Canada and abroad.

Licensing bodies for professional engineers have been established in all the provinces and territories of Canada. Since 1936 the activities of these associations have been coordinated by the Canadian Council of Professional Engineers (CCPE). Among its functions, this Council acts as the accrediting agency for undergraduate engineering programs in Canada through its Canadian Engineering Accreditation Board (CEAB).

The Royal Society of Canada (RSC) was founded in 1882 *for the promotion of literature and science* with an emphasis on scholarship and research. It carries out its mission mainly through its publications, the election of its Fellows and the appointment of panels to assess current issues. Since 1960 it has been organized in three Academies: *L'Académie des lettres et des sciences humaines, the*

Academy of Humanities and Social Sciences and *the Academy of Science*. RSC was patterned after the Royal Society in Great Britain, and the Academies of Arts and Sciences which have long existed in most European countries. Some engineers have been elected into these academies mainly on the strength of their scientific accomplishments. In some of these academies there is provision for a distinct sub-group of engineers.

The concept of independent academies of engineering is relatively recent. A *Fellowship of Engineering* was established in Great Britain in 1976 and evolved into the *Royal Academy of Engineering (RAE)* in 1992. In the United States of America a *National Academy of Engineering (NAE)* was set up in parallel with their Academy of Science in 1964 and provides advisory services to the federal government through the *National Research Council (USA)*.

In Canada, before 1980, the concept of an Academy of Engineers had been discussed sporadically and informally without lasting result. Dr. Robert Legget, for example, spoke in favour in the early 1960s. In 1979, Colin diCenzo and Andrew Wilson independently began consideration of the idea and met to merge their views. In March 1980, they were appointed by the EIC to be a task force to study the Academy concept, “in order to ensure that the Institute has a strong input into the formation of any similar organization in Canada” They noted that the Fellowship in Britain had been formed with the help of the UK Council of Engineering Institutions, and that the US Academy had the assistance of the Engineer’s Joint Council. In Canada, CCPE was generally lukewarm to the idea, and the view in EIC was that the Academy should be independent of existing organizations.

Late in 1981, The RSC appointed a committee to propose actions which it might take to further fulfil its purposes, as it prepared to observe its centenary in 1982. It issued an invitation to CCPE and EIC to send representatives to an informal meeting with its committee to discuss mutual interests. This meeting took place in January 1982, with Gilles Perron and Claude Lajeunesse attending for CCPE, Andrew Wilson and M. S. Mirza for EIC. One of the options was the suggestion that the Academy of Engineering might be established either as an addendum to the Society’s Academy of Science or as a Fourth Academy within the RSC. However, this approach ran into serious trouble over the criteria for membership selection, the RSC criteria being largely based on research and publication, while the engineers stressed that the whole field of engineering needed to be considered. The main conclusion of the meeting was that engineers in CCPE, EIC and ACEC needed to think out and agree on acceptable principles for the desired organization.

Discussions in and among CCPE, EIC and ACEC proceeded slowly throughout 1982. The CCPE Council discussed the matter at its May meeting and appeared to favour an academy under RSC. Simultaneously, an ad-hoc committee was set up by RSC under Alan Davenport to continue discussions with EIC and CCPE. Wilson of EIC wrote a paper outlining the option of a Fourth RSC Academy. The CCPE Council returned to the matter at its November meeting where Perron reported progress and spoke in favour of an academy under CCPE. Representatives of the three engineering federations met in December 1982, and asked Wilson and diCenzo to meet with the representatives of CCPE and the Davenport committee, to prepare appropriate recommendations. By April 1983 no input had been received from the Davenport committee. At its meeting in May 1983, CCPE Council decided “that it had more pressing matters to resolve and that the concept be reintroduced at a more appropriate time”.

It was becoming clear that there was general support for the founding of an Engineering Academy, but not under the auspices of either CCPE or RSC. Wilson and diCenzo continued their efforts. They explored the possibilities of involving the National Research Council and its President, Dr. Larkin Kerwin, in the founding of an academy. In December 1983, Kerwin arranged a meeting with the Minister of State for Science and Technology to discuss the proposal. An Academy of Engineering was also discussed and supported at a meeting of the *National Committee of Deans of Engineering and Applied Science (NCDEAS)* in late 1984. Donald Laplante, Executive Director of CCPE and a guest at that meeting, reported that he could not detect enthusiasm for an academy among CCPE’s executive. In July 1985, EIC President Rice wrote to Dr. Alec Stewart of RSC expressing disappointment that EIC Fellows were not being considered as the Canadian equivalent of Fellows in the UK and USA engineering academies. However, he confirmed continued support of EIC for an academy “which will appropriately honour Canadian engineers for outstanding contributions to the commonwealth”.

RSC appointed a small committee under Dr. Stewart, President of its Academy of Science, to set up a meeting with the various parties. In mid May 1984, Wilson and diCenzo met with the Stewart committee and sent a recommendation to the RSC Council that RSC host, and support financially, a meeting of about a dozen engineers to confirm the desirability of founding an academy and to take the initial steps to bring this about. The RSC Council agreed and sent an invitation to about 15 engineers to meet with incoming RSC’s Academy of Science President, Dr A. Stewart, its Hon. Executive Director, Dr. D. G. Hurst, and four RSC Fellows, to discuss the founding of an engineering academy as a separate entity.

The meeting occurred on 19 August 1985 in Ottawa with Stewart in the chair. The consensus of the meeting was that a separate academy should be formed. Addition of a fourth academy to RSC was thought to appeal to neither the engineering community nor the Fellows of RSC. A provisional founding committee was appointed consisting of Convener Philip Lapp, Camille Dagenais and John MacDonald assisted by Leopold Nadeau as staff person and acting secretary. Approximately 20 members were to be added to the founding committee and a proposal was to be drafted which would not be in conflict with existing organizations. The Articles of Organization and Bylaws of the National Academy of Engineering (USA) were made available as a guide via the good offices of Dr. Stewart. Inauguration of the Academy was envisaged for May 1987, the year of the Centennial of Engineering in Canada. At this stage the Royal Society indicated that it was ready to assist but left further action to the engineers.

The founding committee met on November 7th 1986 with Larkin Kerwin, President of the National Research Council (NRC) as host. He noted that most western countries had academies of the elite among their engineers and that these academies contribute not only to the influence and prestige of the engineering profession, but also to the social and economic well being of their countries. He offered continued assistance from NRC. Those 13 attending the meeting were: Angus Bruneau, Colin diCenzo, John Foster, James Ham, Richard Hiscocks, Larkin Kerwin, Leslie Kirkpatrick, Philip Lapp, Robert Legget, Gordon MacNabb, James McFarlane, Leopold Nadeau and Leslie Shemilt with regrets from a further 13: Raymond Cyr, Camille Dagenais, William Gauvin, Jean-Paul Gourdeau, George Govier, Bernard Lamarre, John MacDonald, Barry Newman, Peter Nikiforuk, Lucien Rolland, Elvie Smith, Harold A. Smith and Donald Stanley. The meeting nominated these 26 invited persons to be the first members of the Academy, elected a Provisional Council of 16 persons and adopted a constitution which had been drafted by diCenzo. The Council then agreed on nominations for the offices of President, President Elect, Vice President and Secretary. It set up a Membership Committee under Gordon MacNabb to select a further 24 members, a Finance Committee under Angus Bruneau to produce a short and long term financial plan, and a By-Laws Committee under Leslie Shemilt to prepare by-laws. It was agreed that the Academy would be incorporated under Part II of the Canada Corporations Act. Provisionally each prospective Fellow was asked to contribute \$200 for the year 1987.

The objects of the Corporation were to be:

- to provide means of anticipating and assessing the changing needs of Canada and the technical resources that can be and should be applied to

- them, and to sponsor programs aimed at meeting these needs;
- to provide independent and expert advice on matters of national importance pertinent to engineering;
 - to recognize outstanding contributions to society and to the country by leading Canadian engineers and to highlight exceptional engineering achievements;
 - to complement the role of existing national engineering organizations, and to cooperate with the Royal Society of Canada and other national bodies on matters involving both their respective fields and the field of engineering;
 - to cooperate with other national academies and international bodies on matters of mutual interest;
 - to serve the nation in connection with significant challenges involving engineering and technology;
 - to do all such other things as are incidental or conducive to the attainment of the above objects.

INAUGURATION

As planned, the official inauguration of the Academy occurred as a featured event at the celebration of the Centennial of Engineering in Canada. The first Annual General Meeting of the Academy was held at the Palais des Congrès in Montreal on May 20th 1987. At this meeting Dr. Robert F. Legget, renowned author and Director of NRC's Division of Building Research, was appointed as the first CAE President. Philip Lapp was named President-Elect, Larkin Kerwin as Vice President and Leopold Nadeau as Secretary and Treasurer. These officers constituted the Executive Committee. They were empowered to name six further Council members to be ratified by letter ballot. A draft constitution and by-laws were adopted. The constitution limited the membership to a total of 250, with not more than 40 to be elected each year.

Dr. John Stirling, then in his 99th year and still active, was named the first Fellow of the Academy and was invited to induct the other 18 Fellows present at the meeting.

For the record, the 44 founding Fellows were: Pierre R. Bélanger, Lionel Boulet, William Boyle, Angus A. Bruneau, Donald Chisholm, J.V. Raymond Cyr, Camille A. Dagenais, Alan G. Davenport, Colin D. diCenzo, John T. Dymont, Bernard Etkin, John S. Foster, William H. Gauvin, Jean-Paul Gourdeau, George W. Govier, James M. Ham, Richard D. Hiscocks, Larkin Kerwin, Lesmere F.

Kirkpatrick, Bernard Lamarre, Philip A. Lapp, Robert F. Legget, Walter F. Light, John S. MacDonald, Gordon M. MacNabb, James R. McFarlane, G. Geoffrey Meyerhof, William G. Morison, Leopold M. Nadeau, Barry G. Newman, Peter Nikiforuk, John L. Orr, Alphonse Ouimet, Arthur Porter, W. Howard Rapson, Lucien Rolland, Robert F. Shaw, Leslie W. Shemilt, Ernest Siddall, Elvie L. Smith, Harold A. Smith, Donald R. Stanley, John B. Stirling. Douglas T. Wright. Greetings were presented by guests on behalf of the Royal Society of Canada, the National Research Council of Canada, and the Federation of Engineering Academies and the Council of Science and Engineering Societies of the USSR. Messages of congratulation were read from the Fellowship of Engineering (UK), the Danish Academy of Technical Sciences, the Australian Academy of Technological Sciences, the Royal Swedish Academy of Engineering Sciences and the National Academy of Engineering (USA). The establishment of the Academy appears to have been welcomed by other science and engineering organizations in Canada, but according to Nadeau was questioned by several individuals who felt that they should have been in the founding group.

Following the inaugural meeting, Legget, Kerwin and Nadeau made an application to the Minister of Consumer and Corporate Affairs for the grant of a charter for CAE by letters patent. These letters patent were issued on April 14th 1988.

The first general meeting after incorporation was held in Ottawa on May 31st 1988. At this meeting a set of detailed rules and regulations were presented and adopted. The first full slate of the Board was elected with Lapp as President, Kerwin as President-Elect, Ham as Vice President, Nadeau as Secretary-Treasurer, and Dagenais, Davenport, Gauvin, Kirkpatrick, Light, MacDonald and Shemilt as Directors. The previously adopted by-laws were simplified to allow greater flexibility of action. Committees for Nominations, Finance and Professional Society Relations were established. Many suggestions were made for the program of action of the academy. Thirty four new Fellows were elected. Secretary-Treasurer Nadeau noted that the income for the year was \$9435. He was happy to report that the Engineering Centennial Board having discharged its obligations, had granted its excess funds of about \$50,000 to the Academy.

The next annual meeting was on May 24th 1989 and was set in Toronto establishing a rotation of venues as Montreal, Ottawa and Toronto, a practice which continued until the Calgary meeting in 2001. President Lapp noted that a suitably furnished office had been provided by NRC and that Leopold Nadeau had been appointed as Executive Director, part time. Initial steps were taken to set up a fund raising campaign. A Program Committee had been established during the

year under the chairmanship of Leslie Shemilt with Alan Davenport, Gordon Inns, Philip Lapp (ex-officio), Gordon Slemon and Danielle Zaikoff as members. This committee presented a comprehensive list of proposals to be considered for academy action.

At the third annual meeting held in June 1990 in Montreal, President Kerwin reported that over \$100,000 had been pledged for the proposed endowment fund, but that no chair had so far been recruited for the funding campaign. Incoming President Ham expressed the view that, with the increase in financial support and the resources at its disposal, the Academy should now take major steps toward its stated objectives.

These first three years of the Academy can be viewed as the inauguration phase. During this period most of the effort of the fledgling body was devoted to internal matters: organizing its governing structure, setting up its four standing committees, electing the first half of its limited membership and acquiring the financial base which would allow opening of a staffed office. Initial steps had been taken in several external action areas – the joint committees with RSC on Disaster Reduction and Health and Safety, and a submission to the RSC study on research. However, most of the mission of the academy remained still to be addressed.

MEMBERSHIP

At its inauguration the Academy decided that its total membership should not exceed 250, i.e. approximately one out of 1000 practicing engineers in Canada. Fellows would be elected in recognition of their significant accomplishments, or contributions to the pioneering of new and developing fields of technology and engineering knowledge, and/or to the art and practice of engineering. Professional integrity was also to be emphasized. Nominations were to be reviewed by a Selection Committee and the list of those selected would be submitted to a vote by the full membership. Approval originally required 75% positive votes but was soon amended to require that there be less than 5% negative votes from the total membership.

In 1992 Founding President Robert Legget arranged with the Canadian Heraldic Authority for the granting of an official coat of arms. He worked closely with the Chief Herald of Canada, Mr. Robert Watt, in devising a distinctive shield of heraldic bearings. The cost of creating these arms was his gift to the academy. The arms were formally presented by Governor General Ramon Hnatyshyn at the

CAE's 1993 annual meeting. An academy logo adapted from the coat was adopted, and a certificate of membership was produced.

When the academy was established it was decided that not more than 40 would be elected in any year. This number has never been reached in any year up to 2002. In 1989 the membership was 107. By 1994 the membership had grown to about 200 with 39% from industry, 24% from consulting, 20% academic and 17% other. Additions to the Academy have ranged between a maximum of 36 in 1989 to a low of 9 in 1996 with an average of about 22 per year.

With the membership approaching the 250 limit a new category of Honorary Members was created in 1995. Fellows whose age was 80 with at least 5 years of membership could enter an Honorary category, with fees reduced to \$50 per year and retention of all privileges except that of voting. These would not be included in the 250 limit. In 1999 this category was renamed Emeritus Fellows and the conditions of admission were changed to require a minimum age of 75 with age plus years of membership totalling at least 86.

The category of Honorary Fellow then became the highest honour of the Academy to be bestowed on a Canadian individual, not a Fellow of the Academy and not necessarily an engineer, who has made outstanding contributions to the profession of engineering in Canada. As of 2002, no Honorary Fellow has been appointed.

In 2001 a comparison with other engineering academies showed that the 1 in 1000 limit of 250 was unrealistically low. The cap was therefore eliminated and the maximum addition in any year was revised to 50. At the same time the criterion for Emeritus Fellowship was changed to a formula of 74/84 for 2002 to be reduced to 72/80 by 2004.

Discussions have continued on the criteria for Fellowship. CAE President for 1997 John Dinsmore summed it up in identifying the academy as a 'network of leaders' noting that 'there is a critical need for the most qualified leaders of our profession to provide objective and sensible analysis on behalf of the public interest'.

FINANCING

At its inception the Academy adopted a policy of independence from government, in order to preserve its credibility and impartiality when giving advice. It would

however accept contracts from government and other organizations for support on studies and projects within its range of concern.

The early organizational meetings of the Academy were assisted by a travel grant from NRC. In its inauguration phase the Academy was assisted substantially by the Centennial of Engineering in Canada. Through good planning by its Board and its Secretary-General, Leopold Nadeau, the Centennial concluded with a surplus of \$50,000 which sum it granted in 1988 to the Academy.

The CAE Board took early steps in 1989 to set up an endowment fund with a target of \$1.25 million. Action was taken to obtain charitable status. Donations to the endowment fund were to be held invested for at least 10 years. Finance Committee chairman Walter Light and other board members approached major engineering companies for contributions and pledges. Several individual members also provided substantial sums. Members were requested to make a donation in addition to their annual dues which had been initially set at \$200. For 1991 these dues were increased to \$250. By mid 1991 the gifts and pledges totalled \$485,000. Income from these invested funds plus member fees provided for a operating budget of \$73,500 for the year 1991.

With increased membership, the income from fees in 1993 rose to \$49,000 and \$22,000 was received from investment income. This total was sufficient to cover the limited office, operation, travel and external membership expenses but left little for the support of academy projects. A new charge of \$50 was introduced for membership certificates and in 1994 the membership dues were increased to \$300.

The academy had achieved its desired independence, receiving its income from fees, interest on its endowment and contracts for studies and reports including the Academy's administration costs. However, in most years income from this contract source was meagre, typically below \$2000. Two notable exceptions were support of \$60,000 in 1996 from NRC, NSERC and the Ministry of Industry to assist in a Technological Entrepreneurship study, and \$45,000 from corporations in 1998 in support of publishing the Engineering Education report.

By the end of its first decade the membership neared its planned maximum and the operating income stabilized at about \$110,000 per year. Operating costs had increased due to added activities and memberships in organizations. During this period many projects were undertaken relying largely on volunteers, with only minimal funding required for printing and dissemination of reports.

With time it became evident that the Academy would continue to have a relatively low profile and impact unless substantial additional funding was acquired. There was some renewed effort to increase the endowment fund. However, the early target of \$1.25M for this fund proved to be overly ambitious. By 2002 the fund remained at about \$500,000.

In the light of its experience, the Academy's approach changed to favour a form of sustained government funding such as is provided for most of the world's academies. It was envisaged that such funding might most likely be granted through a newly formed umbrella organization, the *Canadian Academies of Science*. (See Relations with the Royal Society of Canada below)

OPERATIONS

Much of the early history of CAE is linked to the career of Leopold Nadeau. He was a founder of CCPE and was its Executive Director. As a founding member and Vice-President of the *World Federation of Engineering Organizations* he came in contact with several academies: NAE in USA, RAE in UK and the *Académie des sciences* in France. He became an early promoter of the Academy as a senior independent body from which the government and other public institutions could obtain expert advice. He was in a particularly advantageous position to assist in the inauguration of CAE because of his assignment as Secretary General responsible for preparations for the Centennial of Engineering in Canada set for 1987. This Centennial was not only a major promotional success for engineering in Canada but it also ended with a financial surplus which Nadeau was instrumental in directing toward the establishment of the Academy.

At its first official meeting on May 31st 1988 the CAE Board appointed Leopold Nadeau as its Executive Director in addition to his position as Secretary and Treasurer. Nadeau received a modest honorarium for his services. For the first two years, NRC provided office space in its Sussex Drive building. Some office services were also made available by CCPE and ACEC. In November 1990, a modest office space was rented at 130 Albert Street and was equipped with the further assistance of a grant from NRC. In 1991 a part time office assistant was employed.

Quickly after its inauguration the Academy set up a newsletter, usually four pages in length, to keep the Fellows informed of actions and decisions of the Board and its various committees and also to publish news of interest. This newsletter has continued on a quarterly basis with Issue Number 43 appearing in Autumn 2002.

The issues had side-by-side columns in the two official languages until 1999 when separate copies were produced in the member's language of choice.

In 1996 the Academy inaugurated a web page with the assistance of Fellow Denis Poussart of Laval University. This site provided open information on the academy and access to its published reports. In 1998 a "Fellows-only" section was introduced giving members access to minutes, draft documents and nomination forms. Poussart continued as webmaster until his retirement in 2000 when the site was shifted to the University of Ottawa.

In January 1997 Executive Director and octogenarian Leopold Nadeau retired having served the Academy competently and selflessly since its beginning. He continued for a year as Secretary to the Board. A special tribute was paid to him at the 1997 annual meeting.

Nadeau was succeeded as Executive Director by Pierre Franche who had previously been Executive Director of ACEC. He continued until September 1999 when he resigned for health reasons. He was succeeded by Philip Cockshutt who had been a Director General at NRC until his retirement.

In October 2000 the office at 130 Albert Street was required by the landlord. Conveniently, ACEC in the same building was able to provide the Academy with an interim office. In the summer of 2001 the CAE office moved once again, this time to 180 Elgin Street, sharing premises as well as interests and activities with CCPE.

Approximately 25% of the Academy membership is francophone. Throughout its history the Academy has provided its services to its members and to the public in both English and French. Newsletters are provided in the language of choice and reports are also made available in both languages.

MISSION

The objects of the Academy were incorporated in its original charter and have been listed above, just prior to the article on Inauguration. In 1994 the Academy reviewed its mission to bring it into line with current conditions, adopting the following statement:

"The mission of the Canadian Academy of Engineering is to enhance, through the application and adaptation of science and engineering principles, the promotion of

well-being and the creation of wealth in Canada. The Academy fulfills this mission by:

- promoting increased awareness of the role of engineering in society,
- recognizing excellence in engineering contributions to the Canadian economy,
- advising on engineering education, research, development and innovation,
- promoting industrial competitiveness while preserving the environment in Canada and abroad,
- speaking out on issues relevant to engineering in Canada and abroad,
- developing and maintaining effective relations with other professional engineering organizations, academies and learned societies in Canada, and abroad.”

At about the same time it adopted its own definition of engineering, not a legal one, but a statement of the essence of the profession:

Engineering is a profession concerned with the creation of new and improved systems, processes and products to serve human needs. The central focus of engineering is design, an art entailing the exercise of ingenuity, imagination, knowledge, skill, discipline and judgment based on experience. The practice of professional engineering requires a mastery of engineering methodology together with a sensitivity to the physical potential of materials, the logic of mathematics, the constraints of human resources, physical resources and economics, to the minimization of risk and to the protection of the public and the environment.

DEVELOPMENT AND IMPLEMENTATION

An early action of the academy board in 1988 was the establishment of a Program Committee with membership: Leslie Shemilt (Chair), Gordon Inns, James Kerr and Gordon Slemon with the President and Executive Director ex officio. In addition a number of Fellows were asked to be Corresponding Members, an approach intended to provide country-wide participation. This move proved to be ineffective and the concept was dropped in 1993.

Proposals for action were drawn up under the headings: National Needs Under Change, Current National Issues, Engineering Achievement and Engineering in Cooperative Ventures – National and International. Included were initiatives in innovation, issues statements, awards, the international role of the academy, links to other Canadian engineering societies, and collaboration with the Royal Society on several matters: nuclear waste, natural disaster reduction and global change. The academy membership was to be poled to assess their views on the 10 most

important issues for Canadian engineering.

This comprehensive program was presented to and accepted by the 1989 annual meeting. A revised program was accepted at the 1990 meeting. The original concept was that the Program Committee would initiate projects and recommendations and the Board would be responsible for their implementation. It soon became evident that, while Board approval of actions was necessary, much of the implementation could more effectively be done at the Program Committee level.

In 1990 Leslie Shemilt was appointed Vice-President of the RSC Academy of Science, and he handed over the committee chair to Gordon Slemon.

In 1995 the name of the committee was changed to *The Development and Publications Committee* to reflect not only its responsibility to plan the short and long term activities of the Academy but also its role in overseeing the Academy's publications. Gordon Slemon continued as Chair of the renamed committee until 1997 when he became the Academy Vice-President. John Lockyer was then appointed as his replacement, in addition to the role which he had carried as Editor of publications. On Lockyer's recommendation the name of the Committee was again changed to the *Development and Implementation Committee* to reflect the major role the committee was playing in the implementation of Academy recommendations. Arthur Heidebrecht was appointed as Vice-Chair in 1998. Early in 2000 John Lockyer who had made such a valuable contribution to the work of the committee died after a brief illness. He was succeeded by Heidebrecht.

Typically the Committee has met twice each year, most often in or near Toronto. Starting in 2001 provision was made for teleconference input from members not able to be present at the meeting. Starting in 2002 the spring meeting was by teleconference only, while the autumn meeting continued face-to-face with teleconference input.

ISSUES STATEMENTS

In 1989 the Program Committee did a survey of the views of members on the 10 most urgent engineering problems in Canada. Leading the list were: protection of the environment, waste management, urban infrastructure and energy conservation. The results were given considerable publicity. Outgoing President Kerwin expanded on all ten in his 1990 annual report to the academy.

The Academy has recognized in its mission statement that the public is often poorly informed or misinformed on technical matters. In 1990 the Program Committee took initial steps to launch an Academy publication called *Engineering Issues*. The stated objective was “to provide reliable, timely, unbiased information to the Canadian public on issues in our society which are important to health, safety and public policy”. A set of guidelines was prepared and Fellows were invited to submit material in their special areas. The issues were to be particularly directed to media personnel who make decisions on what information reaches the public and on who gets access to airwaves and print outlets. An Editorial Review Board was appointed to vet each issue to ensure that Academy standards were preserved. Initially, it was hoped that there could be two issues per year. Program committee members John Lockyer and Mark Abbott were appointed as joint editors of the Issue Statements.

The first formal publication by the Academy was the Issue entitled *Managing the Environment – The Engineering Challenge* by Donald R. Stanley, published in December 1991. The following are the subsequent issues up to 2003, all by Fellows of the Academy and all available on the academy’s website: www.acad-eng-gen.ca

Achieving Competitiveness in Canadian High Technology Industry – Morel P. Bachynski (December 1992).
Risk, Safety and Society – Mark Abbott and Ernest Siddall (July 1993).
The Central Role of Design in our Economy – John Lockyer (November (1993).
Natural Disaster Reduction in Canada – Alan G. Davenport (August 1995).
Lifelong Learning for Professional Engineers – Clement W. Bowman (September 1997).
Wealth Through Technological Entrepreneurship – summary of a CAE Task Force Report (March 1998).
Evolution of Engineering Education in Canada – summary of a CAE Task Force Report (December 1999).
Security and the Engineering Profession in Canada – Arthur Heidebrecht (December 2002)
Energy and Climate Change – summary of a Task Force Report (March 2003).

Much of the work of producing these issues and other Academy publications was contributed by the Program Committee editor, John Lockyer, prior to his untimely death in 2000.

Copies of the *Issues* have been provided to the Fellows and to an extensive

mailing list including industry, engineering organizations and the press. It is difficult to obtain the feedback needed to assess the impact of these papers.

ENGINEERING AWARENESS

An early concern of the Academy was the need to acquaint young Canadians, various authorities and the general public about engineering. The federal government had been sponsoring a *Science and Technology Week* which made no mention of engineering as a distinct profession. In 1991 the Academy joined forces with CCPE, ACEC and EIC to plan and launch a major event to promote engineering awareness incorporating a number of local activities already under way. In April 1992 a week long *Festival of Engineering* with Fellow Gerald Maier as Honorary Chair was held in Ottawa. It was opened by the Governor General and coincided with the annual meeting of CCPE. The theme was *Engineering our Future* and was directed at students, parents and teachers. The Festival was continued in 1993 with opening and closing ceremonies held in Ottawa and Calgary respectively. The name was then changed to *National Engineering Week (NEW)*. This event has continued and grown each year. It is held usually in March with events held in many centres across Canada. Engineering Week has been chaired by CAE Fellows Eric Newell in 1998 and Julie Payette in 2001. NEW is no longer co-sponsored by CCPE, ACEC, ECC and CAE, but the Executive Directors of these central four engineering groups continue their co-operation through periodic meetings.

Beginning in 1990 the Academy initiated a sporadic participation in the Committee of Parliamentarians, Scientists and Engineers (COPSE). This organization was established to familiarize members of the House of Commons and the Senate with science and engineering issues, largely through luncheon meetings. A theme *Productivity, Job Creation and Competitiveness* was proposed by the academy for the 1993 meeting.

In 1994 the Academy was invited to appear before the House of Commons Standing Committee on Finance. Together with its partners, CCPE, ACEC and EIC, it submitted a brief entitled *The Role of Engineering in Building a National Strategy in Science and Technology in Canada*. These invitations have been regularly repeated about once a year giving the academy a useful opportunity to support desirable government action and also an opportunity to educate the Finance Committee members on engineering priorities.

In 1993 President Alan Davenport initiated a project to collect and generate a set of Case Studies which could be made available to engineering faculties and their

students. An initial case study on timber in construction was produced and circulated. A few other case study initiatives were undertaken, but this did not develop into a regular academy service.

The Academy agreed in 1995 to cosponsor with CCPE and NRC an electronic database for use in schools, museums and homes based on the lives of inductees in the Canadian Science and Engineering Hall of Fame.

The Academy has been associated more recently with the *Partnership for Science and Engineering (PAGSE)*, an organization set up in Ottawa as a successor to COPSE, to improve communication between the science and engineering community and Members of Parliament through breakfast meetings with appropriate speakers. At one point in 1996 PAGSE set up a committee to respond to the Federal Strategy on Science and Engineering document *Science and Technology for the New Century*. The report of the committee *Setting Priorities for Research in Canada* when issued listed CAE as a party. However, CAE had not been consulted and it disagreed with the report's conclusions. This led to CAE's withdrawal from PAGSE. It rejoined in 1999.

Much had been accomplished in promoting engineering awareness over the academy's first 15 years, mostly in cooperation with other engineering groups. However, awareness of the existence and activities of the Academy itself was still limited, even among professional engineers in Canada and was still more fragmentary among the general public.

RELATIONS WITH THE ROYAL SOCIETY OF CANADA

The Royal Society of Canada was founded more than a century before the CAE, and included science within its mandate. It had established a prominent image particularly among the academic community. RSC had explored the concept of incorporating engineering as a fourth academy under its umbrella as far back as 1982, but it was soon evident that neither RSC nor the engineers favoured this approach. The Royal Society was of considerable assistance, however, in the steps that brought CAE into existence.

Soon after its inauguration, CAE linked with RSC on a number of joint studies such as Health and Safety, Disaster Reduction, and Public Awareness. These are discussed in separate sections. Of the three, only the collaboration on Disaster Reduction continued to completion.

In 1988, RSC obtained substantial funding from the federal government to undertake a major study of research in Canadian universities. In 1990 CAE submitted its perspective on the engineering aspects of the topic to the RSC President. The RSC report *Realizing the Potential : A Strategy for University Research in Canada* was considered by CAE to give inadequate attention to engineering research. This RSC report received an unfavourable review from a government consultant and federal support was substantially reduced.

In 1991 RSC sought to amend its charter so that it would become *The National Academy of Canada*. CAE communicated its objections but RSC chose to ignore them. CAE then joined with the representatives of Arts and Medicine societies in a direct submission of concern to the federal government. RSC then agreed not to seek exclusive use of the proposed title.

In 1993 the Minister of Science Tom Hockin appointed a National Academy Review Panel to examine the role of academies in other countries and to provide him with advice on the matter. CAE Fellows Curlook, MacNabb, Nadeau and Slemon met with the panel and stated that CAE did not support an all-inclusive National Academy. Rather it proposed an informal liaison of existing academies and bodies. No action was taken. A further attempt was made by RSC in 1995 to renew their proposal to establish a National Academy. CAE submitted a brief to the Minister of Industry stating its objections. Subsequently the senior Minister of Industry, John Manley, turned down the RSC proposal and suggested that a network of cooperating agencies would be preferred.

By 1999 it became evident within CAE that its policy of financial independence was severely limiting its capability, and that some form of government funding was needed if it was to be really effective as voice of engineering and an advisor to government and the public. Jointly with RSC, a proposal was developed for a new umbrella structure to be called the National Academies of Canada. (NAC) . This was presented to the Secretary of State for Science, Research and Development, Gilbert Normand, asking him to consider allocating about \$3M per annum in support. This funding would permit the academies to expand greatly their role in providing expert panel advice and would also provide partial support for international activities and for the staff operations of the constituent academies. It was envisaged that the nascent Canadian Academy for Health Sciences (CAHS) would be included.

In October 2000 Minister Normand organized a Day of Reflection on this issue, which was attended by representatives of over 100 organization including CAE, EIC, CCPE, ACEC, NSERC, RSC, members of the medical community, the

Royal Academy of Engineering (UK) and the Académie de France. The need for an umbrella body was generally accepted, but there was division on whether it should be a voice of the three founding members, RSC, CAE and CAHS, or whether it should include a much broader representation. The Minister was strongly supportive of the general concept and fortunately he was re-appointed after an election. The proceedings of the day of Reflection were summarised in a report *Using Knowledge to Advantage: The Need for a National Science Organization*. The Minister then appointed a broadly based Working Group to develop a refined proposal. This proposal showed that there was a broad and diverse base of support within Canadian stakeholder communities for the establishment of NAC. On the advice of the federal government, the entity was subsequently re-titled the *Canadian Academies of Science (CAS)*, and Letters Patent were granted in 2002.

Early in 2002 both the Minister of Industry and the Secretary of State for Science, Research and Technology were replaced in a cabinet shuffle and the process of promoting and funding the CAS concept had to be restarted. After three years of effort, the three academy participants in the CAS proposal remain hopeful.

Relations with the Royal Society have not always been smooth but following the *Canadian Academies of Science* initiative cooperation has been good. Both societies see the need for a stable source of continuing government funding, so that their valuable source of expert and volunteer advice can be made effectively available to the Canadian community.

HEALTH AND SAFETY

In 1990 the Program Committee took its first steps toward linking CAE with RSC on the issue of the management of safety. By the next year a 15-member Joint CAE-RSC Committee on Health and Safety was set up with Neils C. Lind, FRSC as Chair, Ernest Siddall, FCAE as Secretary, and with Alan Davenport and Douglas Wright as members from CAE. The committee objectives were:

- to further the development of risk assessment as a science,
- to develop risk management as an applied science and
- to evolve and propose rational policies with respect to health and safety.

By 1992 CAE felt that the focus had become too medically oriented, with little attention being given to engineering aspects.

The Joint Committee issued a report in July 1993: *Health and Safety Policies – Guiding Principles for Risk Management*. Prior to its publication CAE President Davenport expressed concern about the lack of engineering content. On an initiative by Leslie Shemilt, the Joint Committee organized a symposium entitled *Managing Risk to Life and Health* for October 1993 . There remained concern that insufficient attention was being paid to engineering issues. When the *Health and Safety Policies* report was issued, CAE regarded it as unsatisfactory and asked that its name be withdrawn. On its own the Academy produced an Issues Paper *Risk, Safety and Society* by Mark Abbott and Ernest Siddall.

The Joint Committee issued a proposal for the establishment with federal funding of a National Panel on Public Risks under both CAE and RSC but completely ignored CAE in the balance of the proposal. Meetings with RSC failed to resolve the matter and in August 1994 the CAE Board decided to resign from the joint committee.

NATURAL DISASTER REDUCTION

At the inaugural meeting of CAE, Alan Davenport drew attention to a plan to establish, under the United Nations, an *International Decade for Natural Disaster Reduction* for the period 1990-2000. At the 1988 annual meeting he reported on the movement which was supported by the NAE in USA. He was delegated to represent CAE on this matter, and to recommend on CAE participation. By the time of the 1989 annual meeting a Canadian National Committee including CAE and RSC representatives was set up with Davenport as Chair. Late in 1989 Canada sponsored a resolution at the United Nations General Assembly and the next year a UN resolution was passed establishing the Decade. A report was produced outlining the contributions that Canada could make to lessening the increase in natural disasters.

In 1991 the Canadian Committee approached the federal government seeking funding for its activities. After a considerable delay funds were granted in a 1993 federal contract to RSC to provide administrative services to the National Committee. CAE involvement was clarified and direct reimbursement was allocated to CAE for its contribution to administration. By 1994 the Committee was fully operational, conducting a survey of programs already in place. A World Conference on Natural Disaster Reduction was held in Japan.

In 1995 the Committee produced a mid-term report and CAE decided to continue its support. A news bulletin outlining the activities was issued. In the second half

of the Decade the funding for the committee was reduced but activities continued including several conferences and publications.

This involvement in the Disaster Reduction Decade has proved to be a most effective cooperation between CAE and RSC .

Further to the Disaster theme, *Registered Engineers for Disaster Relief (RedR)* is an established international activity, bringing engineers into disaster response situations. RedR maintains a roster of pre-selected and pre-trained engineers who can be rapidly seconded from their regular employers and dispatched to a disaster site. In 2001 ACEC took action to establish *RedR Canada* and invited CAE to be a co-sponsor. As of 2002 an initial register of qualified persons available for assignment, and an identification of potential corporate partners was in preparation. Recruitment and training were also proceeding.

NUCLEAR ENERGY

The Canadian Academy of Engineering has acted on several occasions in matters relating to nuclear energy in Canada. In 1989, members of the Academy strongly endorsed expanding the laboratory activities of Atomic Energy of Canada Ltd. (AECL), and in 1990 the federal government renewed its commitment to sustaining nuclear energy as an option for Canada, including 7-year funding for AECL.

In October 1989, the Federal Environmental Assessment Review Office (FEARO) established a Review Panel, with broad terms of reference, to review a concept for the disposal of Canada's nuclear fuel waste. This had been the subject of a major research program initiated in 1978 under a Canada/Ontario agreement and was conducted by AECL. The FEARO Review Panel made intervenor funding available for a series of information meetings and scoping sessions, as a prelude to issuing guidelines for the environmental assessment of the nuclear waste disposal concept. In 1990, the RSC invited CAE to join in the review process and a Joint Committee under Dr. Robert Haynes (later President of the Royal Society) obtained funding adequate for meetings to prepare and present its common view at a hearing in Montreal in 1991 on the assessment guidelines. Final guidelines were issued by FEARO in 1992 but it was not until 1994 that a ten-volume *Environmental Impact Statement on the Concept for Disposal of Canada's Nuclear Fuel Waste* was issued by AECL.

The Review Panel then scheduled public hearings, with FEARO again providing funding under its participant funding program. CAE and RSC applied successfully for participant status. The funding provided for travel, meeting and administrative costs but made no provision for overhead or salaries. CAE named 5 members to the reconstituted RSC/CAE Joint Committee including its Chairman, Alex Taylor. Public Hearings were conducted in three phases, and members of the Joint Committee made presentations in each case: the first phase on ethical and social issues in April 1996, the second on scientific and technical aspects in June 1996, and the third on safety and acceptability issues in January 1997. The Review Panel issued its report to the Federal Government in February 1998 through the Canadian Environmental Assessment Agency (successor to FEARO). The Panel Report's key conclusions were that the safety of the deep disposal concept was technically sound but that it had not been demonstrated as socially acceptable.

The federal government responded to the Report, and in 2002 brought into force the Nuclear Fuel Waste Act which created the Nuclear Waste Management Organization (NWMO). NWMO is funded entirely on a not-for-profit basis by the fuel waste producers, and is mandated to present its final recommendations to government in three years. Based on wide national consultations its first discussion paper "*Asking the Right Questions*" was issued in November 2003. Neither the RSC nor the CAE have been approached directly for their views. However the *pro bono* collaboration between the Academy and the Royal Society in the 1990s demonstrated admirably the benefits that qualified engineers and scientists can bring to an issue of national importance.

In 1993 Canadian Engineering Human Resources Board of CCPE asked CAE to produce an independent accurate paper on nuclear power. The Board considered this request and suggested that Leslie Shemilt prepare material for a CAE Issues Paper. However, this initiative was abandoned when CAE became involved in the above environmental assessment of nuclear waste.

In May 1995, the Ontario Ministry of Environment and Energy requested the Royal Society to assist in resolving technical issues which had arisen in regard to updating the Provincial Nuclear Emergency Plan. The latter was to be carried out by the Office of Emergency Services Ontario in the Ministry of the Solicitor General, and the issues had arisen between that Office's advisory Working Group and Ontario Hydro. The Royal Society responded positively with the understanding that the Canadian Academy of Engineering would appoint a consultant to join with the Society nominees, A.T. Stewart and W.R. Bruce. The CAE named Leslie Shemilt, and a contract/terms of reference agreed to by all

parties in December 1995. The contract included expenses, honoraria, and overhead. In November 1996 a *Report to the Ministry of Environment and Energy Concerning Two Technical Matters in the Provincial Nuclear Emergency Plan* was submitted by Bruce, Shemilt, and Stewart with the imprimatur of the Royal Society and the Academy. The Report's recommendations were accepted by the parties concerned.

In 1996 on another nuclear related issue, the Academy wrote to the Minister of Natural Resources supporting a proposal for siting the International Thermonuclear Experimental Reactor (ITER) in Canada. The Reactor would be jointly sponsored by the European Union, Japan, Russia and USA. The Minister's response was that this project was not of sufficiently high priority at that time to justify federal funding for development of a bid. However, it was noted that the economic benefits merited consideration. The issue of ITER arose again in 2000 but no action was taken, in view of the Academy's broader study on Energy and Climate Change.

ENGINEERING RESEARCH

Referring to the objects of the Academy, the health of research in Canada is 'a matter of national importance pertinent to engineering'. Throughout its first 15 years, research has been a prominent concern in the CAE program.

In 1988 the Royal Society of Canada was granted substantial funding by the Federal Government to evaluate university research in Canada. The Academy communicated to the RSC some of its views on the special nature of engineering research and in particular of engineering research in our universities. In 1990 RSC issued a report "*Realizing the Potential : A Strategy for University Research in Canada*". CAE set up a Program sub-committee with membership: Pierre Bélanger, Walter Curlook, James Ham, Edward Rhodes, John Roth and Gordon Slemon (Chair) to review this report. Their review indicated that the report had largely ignored the concerns communicated earlier by the Academy to RSC. The Academy felt that the policies and funding of engineering research in Canadian universities should be such as to enable a much greater contribution to the well-being of the country, especially in the areas of competitiveness, productivity and quality.

Early in 1991 the CAE Board asked its sub-committee to act as a Task Force to undertake its own study of engineering research rather than to react to the RSC report. The Task Force report "*Engineering Research in Canadian Universities*"

issued in August 1991 emphasized the distinction between scientific and engineering research. It called on engineering professors to increase their contributions to the solution of present and future issues of Canadian society. It urged universities to adopt distinct criteria for the evaluation of engineering professors, criteria that would emphasize the special role of engineering research. It called for engineering research funding programs that were more closely linked to the users of research, and for major involvement of these users in research review panels.

This was the first formal report produced by the Academy. The Task Force which produced it never met, but conducted its communications through periodic mailings. As a result the cost of producing the report was minimal. Generously, the firm SNC provided the French translation. All of the Academy's reports are available on the CAE website: www.acad-eng-gen.ca

In 1992 emphasis was placed on implementation of this report. Copies were widely distributed to Fellows, engineering deans, industry, government, technical societies and the press. The Task Force Chair Slemon met with NCDEAS on two occasions, and received their unanimous endorsement for the report's recommendations. He organized and chaired a panel discussion on *Engineering Research and its Impact on Education* at the Canadian Conference on Engineering Education (C2E2) in Quebec City. He met with the Minister of Science and the President of the Science Council of Canada. The report was a source document for an NSERC Workshop on University Engineering Research and was submitted to Canada's Prosperity Task Force.

In the following decade the climate for engineering research in Canada changed considerably, and parts of this change may have been due to the influence of this report. In 1994 NSERC drew up a Strategic Plan which introduced major funding for research partnerships between industries and universities. The Academy arranged to be represented at each of the regional conferences held across Canada on the federal government's science and technology review. CAE joined with its partners CCPE, ACEC and EIC to submit a brief to the National Roundtable on Research in October 1994. This brief emphasized the special nature and criteria of engineering research in universities, called for greater autonomy for engineering faculties in universities, supported the NSERC strategy as stated in its publication *Partnership in Technology* and asked for increased partnership between universities and industry. In 1995 CAE joined again with CCPE, ACEC and EIC in supporting the recommendations of the National Advisory Board on Science and Technology (NABST), reiterating many of the points raised in the Academy's earlier research report.

NABST's successor agency, the *Advisory Council on Science and Technology (ACST)*, set up an Expert Panel on Commercialization of University Research which issued a report in May 1999 entitled *Public Investments in University Research: Reaping the Benefits*. The Academy asked Fellows Toby Gilsig (Chair), Morrel Bachynski, Michael Charles and Indira Samarasekera to prepare a response. Their report, issued jointly by CAE, CCPE, ACEC and EIC, supported the objective of increasing the return on research investment, noted the shortage of experienced commercialization personnel, and pointed out ways that the tax system provided a disincentive to entrepreneurship.

In 1996 the CAE Research report was used as a source document for an NSERC study of the criteria for its Grant Selection Committees. Also in 1996, the Academy noted with great pleasure the appointment of Fellow Dr. Thomas Brzustowski as President of NSERC.

In May 1997, the Government of Canada established the Canada Foundation for Innovation (CFI) with an initial capital of \$800M to invest in infrastructure for research and development in universities and other not-for-profit research organizations. Three CAE Fellows were appointed to the CFI Board and the initial President was CAE Fellow Keith Brimacombe, who regrettably died soon after taking office. The Academy wished to ensure that investments by CFI would achieve its innovation purpose and offered the expertise of its Fellows on CFI review panels. 1998 CAE President Slemon met with CFI President David Strangway to emphasize the Academy's concern.

In May 2002 the Academy lent its support to a symposium on Research and Security organized by RSC. Topics addressed were emergency response, US/Canada border issues, bio-terrorism and information sharing.

In the years following the CAE research report a distinct trend toward reform in university-based engineering research was evident. However, it was recognized that implementation of several of the Academy's recommendations would be expected to occur only gradually.

ENGINEERING EDUCATION

Throughout its history, the Academy has focused on engineering education as the primary key to improvements in the service that the engineering profession brings to society. Learning in 1988 that CCPE and NCDEAS planned to produce a joint report on engineering education, the Academy Board asked its Program Committee to set up an ad hoc committee under Lapp and Slemon to keep a watching brief. The joint report *The Future of Engineering Education in Canada* was issued in October 1992. CAE strongly supported the initiatives and recommendations of this report, but felt that more significant changes were needed in the cultures, practices and policies of all participants in the engineering education process. The Board asked its Program Committee to set up a Task Force on Engineering Education to define the key educational objectives and the changes that were needed to achieve them.

The Task Force members were Wojciech Bialkowski, Reinhold Crotofino, Roland Doré, George Ford, Monique Frize, James Ham, William James, John Lockyer, Martha Salcudean, Gordon Slemon and John Wilson. Ham was initially asked to chair this Task Force but transferred responsibility to Slemon at an early stage.

After an early collection of ideas and concepts from the Task Force members, the chair produced a first draft report. This was sent by mail to the members asking for their comments, corrections and additions and indicating that the next draft would be started in three weeks. Lack of response was regarded as agreement. As with the research study, the Education Task Force never met physically.

After several rounds of revision and expansion, the CAE report *Engineering Education in Canadian Universities* was completed and issued in August 1993. The report called for broader, more integrated undergraduate engineering programs, with emphasis on design and social context, one year professional masters programs, more formal engineer-in-training programs, more formal continuing education, expanded cooperative research programs and enhanced professional experience for engineering professors. Its 61 detailed recommendations were directed at engineering faculties, the engineering profession, Canadian industry, universities, governments and at CAE itself.

The report was widely disseminated and another task force was appointed to implement its recommendations. Throughout 1994 and into 1995 meetings were held with CCPE, with NCDEAS, with NSERC, with CEAB and with university presidents to discuss the recommendations. At the June 1994 Conference on

Engineering Education, Slemon presented a paper on *Implementing Evolution in Engineering Education*.

The Academy's concern for reform in engineering education was shared by both CCPE and NCDEAS. A five-member committee representing these two organizations and including four Academy Fellows produced a further report in 1996: *The Changing Engineering Profession and Engineering Education*. This document summarized the recommendations from several studies including that by CAE and reported on the initiatives currently being taken.

Progress in implementing change was however slow, hampered partly by a shortage of funding for engineering faculties but more importantly by some structural limitations in the universities. After focusing on several other issues, the Academy returned to the topic of engineering education in 1998, establishing a Task Force to examine the several roles in which engineering faculties were or should be involved. The Task Force membership was Douglas Barber, André Bazergui, Michael Charles, Arthur Heidebrecht (Chair/Convener), Michael Isaacson, Edmund Kuffel, David Lynch, Mohan Mathur, Ronald McCullough, John McDougall, Axel Meisen, Edward Rhodes, Gordon Slemon (Editor), Martha Salcudean and John Wilson. It soon became evident that an adequate treatment of all these roles could not be achieved in a single implementable report, and it was decided to focus first on establishing desirable directions for the evolution of engineering education in Canada over the next decade. The deletion of research concerns from the scope resulted in the withdrawal of Isaacson, Meisen and Salcudean from the Task Force.

The production of the report was similar to that of the preceding one except that the process was now greatly expedited by e-mail communication and a limited use of teleconferencing.

The report *Evolution of Engineering Education in Canada* was issued in December 1999. In contrast with the earlier education report it contained only five general recommendations:

1. Engineering faculties should ensure that breadth of learning, beyond the technical aspects of the specialist engineering discipline, is a major thrust in engineering education.
2. Engineering faculties should emphasize the development of the learning skills of their students.
3. Leaders of engineering faculties should ensure that their faculty members have the vision, values and behaviours needed for their evolving role in preparing undergraduate and graduate students to function effectively in

- our rapidly changing world.
4. Research conducted in engineering faculties should be characterized by excellence, by relevance to industrial and social issues and by concern for the life preparation of the graduate students involved.
 5. Engineering faculties should participate in providing liberal education opportunities for all university students, and in improving the technological literacy of the general public.

Extensive effort was put into disseminating the report and implementing the detailed aspects of its recommendations. These efforts and the production of the report were supported by generous contributions from 11 corporations arranged by 1999 President Alex Taylor.

The report was the theme of the 1999 annual meeting in Montreal. It was discussed with NCDEAS at their April 1999 meeting. A session on it was presented by Fellows Kuffel and Slemmon at the Canadian Congress of Engineering Students in Winnipeg in January 2000. President Taylor met with the CEAB in February 2000 for a detailed discussion of the report's recommendations.

Meetings of groups of task force members were set up with a number of university presidents together with their deans of engineering, arts, science and graduate studies. Reception of the engineering-related aspects was generally positive, but impediments were cited in resource limitations, faculty attitudes and the accreditation process. However the reaction to the suggested role of engineering in educating other university students was lukewarm at best.

In 2001 President Bouchard brought to CCPE the recommendation that it set up a comprehensive review of the accreditation process. However, CCPE preferred to continue an incremental approach to CEAB policies and practices. CAE has seen its role in engineering education as setting forth ideals and evolutionary directions to which CAE believes educators and students should aspire. It is accepted that realization of these ideals will be a long and continuing process.

LIFELONG LEARNING

Professional development for engineers was a prominent issue in the 1990s partly because of a concern in provincial governments that the competence of all licensed professionals be assured on a regular basis. In response the associations within CCPE took a variety of approaches. In 1996 the renamed Development

and Implementation Committee asked Fellow Clement Bowman to assemble a Task Force to provide advice on this issue. Other academy members of the task force were Douglas Barber, André Bazergui,, Richard Dillon, Gerald Hatch, Arthur Heidebrecht, Philip Lapp, John Lockyer and Gordon Slemon. Other contributors were Hira Ahuja from the Educational Program Innovations Center, Michael Bozozuk of EIC, Ron Gray of Syncrude, Vinod Garga of EIC, David Hogg of the High Performance Manufacturing Consortium, Clarke Henry of Imperial Oil, Alan Pelman of MacMillan Bloedel and Jac van Beek of KMPG Consulting.

The report entitled *Lifelong Learning for Professional Engineers* was published in October 1997. It affirmed the imperative role of effective and continued professional development in ensuring public safety, a sustainable environment, a competitive national economy, a respected profession, a profitable employer and a fulfilling career. It presented guidelines for employees, employers, educational institutions and professional and technical engineering societies and included a review of best practices of leading engineering organizations. The report left the requirements for continued licensing to be decided by the professional associations, but recognized that the primary responsibility resides with the individual engineer, actively supported by all stakeholders.

The report was sent before publication to CCPE for comment. At CCPE several issues were raised, so amendments were made by CAE and the CCPE representatives were deleted from the Task Force list.

As had become the practice of the Academy with its limited financial resources, the work of this task force was conducted entirely by correspondence, mainly electronic, the chairman producing drafts and sending them out for comment from task force members.

The report was featured in the program of the 1998 academy's annual meeting. A panel discussion was followed by input from the assembly. Copies of the report were widely distributed, and regional coordinators were asked to promote it personally with their local governments and associations.

COMPETITIVENESS AND ENTREPRENEURSHIP

Throughout its history the Academy has had a continuing concern to support the role that engineers play in the economy through innovation, entrepreneurship and improving Canada's competitiveness in the world market.

The 1989 annual meeting featured a session on *Innovation and Canada's Prosperity – The Role of Engineering*. President Larkin Kerwin noted Canada's world leadership in areas such as communications, small aircraft and space data reduction but pointed out deficits in technology trade and called for better engineering education and more industrial R&D.

A Task Force on Competitiveness was set up in 1992 chaired by Morrel Bachynski. The objective was to prepare a brief to the appropriate federal government committee on this matter. Little progress was made and in 1993 the chair asked that the Task Force not be reappointed.

In 1995 the Academy returned to the topic and appointed a new Task Force to identify educational and industrial initiatives needed to stimulate technological entrepreneurship. Fellow Roger Blais was appointed as Chair. Members were Denzil Doyle of Capital Alliance Ventures, Toby Gilsig of M3I Systems, Gerald Heffernan of Heffernan and Associates, Bernard Lamarre as President of the Ordre des Ingénieurs du Québec, Jacques Lyrette of NRC, Michael Maher of the University of Calgary and Joseph Paradi from the University of Toronto. Financial support for the project totalling \$60,000 was provided equally by NRC, NSERC and Industry Canada.

The Task Force quickly produced a major background report entitled *Technological Entrepreneurship and Engineering in Canada*. This report cited areas in which productivity growth could be achieved. It identified a Canadian innovation gap rooted in several major deficiencies as compared with other major industrialized countries. Through its 234 pages it presented a wealth of information on innovative firms, technical entrepreneurs, financing of innovation, spin-offs, internet entrepreneurship and entrepreneurship education in universities.

Technical entrepreneurship was made the theme of the 1997 CAE annual meeting. About 1000 copies of the report were provided free to those listed by the sponsors and to the news media. Copies were also made available for sale. Five regional meetings were held later in 1997 in Toronto, Halifax, Montreal, Calgary and Vancouver for discussion of the report's implications.

Based on the Blais report the Academy produced in March 1998 a document presenting its recommendations for the advancement of technological entrepreneurship in Canada entitled *Wealth Through Technological Entrepreneurship*. The key recommendations were:

- to empower every student in Canadian schools with literacy in mathematics and science;
- to ensure that every engineering student has orientation in entrepreneurship;
- to establish a Canada-wide internet-based network to assist entrepreneurs;
- to encourage universities to establish entrepreneurship centers and joint engineering and business programs in technological entrepreneurship;
- to set up innovation centers in each province to stimulate start-ups;
- to improve communications between entrepreneurs and sources of financing;
- to establish a broadly-based cooperative effort involving the engineering profession, business leaders, governments and the general public.

To implement this ambitious plan the Academy proposed formation of a *National Steering Committee on Technological Entrepreneurship in Canada (NASCENT)* involving 13 founding member organizations with funding from the federal government. The Academy offered to coordinate the work of this body. Copies of the two reports were presented directly to several of the provincial Ministers of Education. Fiscal aspects of the report were included in a presentation to the House of Commons Committee on Finance. The inclusion of entrepreneurship in engineering curricula was referred to CCPE and CEAB. CAE provided the leaders for a session at the CFES Congress of Engineering Students in January 1999 on the technological entrepreneurship theme.

CAE President for 1988 John Dinsmore undertook personal but temporary responsibility to quarterback the promotion of the NASCENT concept. Efforts were made to recruit a prominent person to chair NASCENT during its continuing stages. No one of those approached was willing to take on this major task. It proved difficult to hold the diverse group together without such a leader and this highly promising initiative was eventually discontinued. On the positive side, effective steps were noted in the teaching and encouragement of entrepreneurship in several universities.

THE ENGINEERING PROFESSION

Throughout its history the Academy has maintained a close relationship with the Canadian Council of Professional Engineers (CCPE) and its constituent provincial associations. The Academy sees its role as one of leadership in formulating desirable principles, priorities and directions for the evolution of the engineering profession, stimulating discussion and action in the appropriate licensing bodies.

A number of issues and challenges to the profession have been identified: a decrease in professional engineering licensing by recent graduates, the expanding roles for engineers, the lack of public understanding of engineering and an increased public concern for health, safety and the environment. President Gordon Slemon had explored some of these issues in his 1998 IEE Hearn Lecture. In 2000 the Board set up a Task Force of 40 Fellows under his chairmanship to report on areas where the engineering profession could evolve to address some of these issues and thus enhance its stature and its service to the public.

A comprehensive draft document *Evolution of the Engineering Profession* was produced with 27 recommendations. This draft was shared with officers of CCPE to obtain their perspective. The Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA) invited Slemon to discuss these recommendations at their annual policy retreat.

The CAE Board considered the original scope to be too cumbersome for ready implementation. Accordingly, the Task Force extracted a report entitled *Protecting the Public and the Environment – A Responsibility of Canadian Professional Engineers*. This report issued in February 2002 focused on the basic reason for existence of a licensed profession, the protection of public health and safety. It recommended that CCPE establish a standard definition of engineering including extended safeguarded areas and a defined individual acceptance of responsibility to the public. It proposed that such responsibility apply not only in areas of direct service to the public but also in corporations producing products and services critical to health and safety.

The report was directed particularly to the provincial professional engineering associations and their members for consideration. Regional coordinators were encouraged to assist in promoting local discussions. Copies were sent to the Securities Commissioners and to the responsible Ministers in most provinces.

The Task Force produced a second report derived from the *Evolution of the Engineering Profession* draft, entitled *Assuring Competence in the Canadian Engineering Profession*. This report supplemented an earlier 1996 CCPE report *Continued Competence Assurance of Professional Engineers* which was directed to practicing engineers only. The CAE report recommended that CCPE undertake a comprehensive review of its accreditation criteria to ensure that engineering graduates would have adequate preparation for the evolving needs of the profession, that criteria for entry to the profession be reviewed to include enhanced requirements for Engineers-in-Training, that these entry criteria be

adopted nation-wide, that common standards for the acquisition and reporting of evidence of continued competence be adopted, and that employers be encouraged to provide their employees with adequate opportunity and resources to enhance their professional competence.

As a further action arising from the Evolution draft and the Protecting Report, President Claude Lajeunesse wrote to the Ontario Securities Commission recommending that public companies be required to commission an independent audit of the company's performance and compliance on health and safety, that the audit team include professional engineers, and that the audit be included in the annual report to the shareholders. The Commission took the matter under advisement but indicated that it was not yet a high priority.

ENERGY AND CLIMATE CHANGE

The issue of an adequate supply of energy and its impact on climate has been sporadically on the agenda of the Academy since its early days. The 1991 CAE annual meeting featured a seminar on Energy with input from Dr. W.S. Fyfe, Head of Canada's Global Change Program and from Fellow John Foster who was that year's president of the World Energy Council. At the 2000 annual meeting, President Alex Taylor expressed his conviction that the Energy / Climate issue deserved attention by the academy.

In September 2000 a Working Group under the chairmanship of Jozinus Ploeg was formed to define a role for CAE in the Energy / Climate debate. The Group reviewed a wide range of data on climate change and on present and projected energy demand and supply systems. The results of this review were presented at the 2001 annual meeting in Calgary. In March 2002 a report was published entitled *Energy and Climate Change – a Canadian Engineering Perspective*. The report summarized the long-term energy supply and demand possibilities for Canada and the world. It concluded that hydrocarbon-based sources could satisfy the anticipated energy needs for this century but only with an unacceptable impact on the environment. It commented on renewable and alternative energy sources, and stressed that a long-term sustainable energy strategy needed to be developed with adequate priority for Canadian independence.

The Task Force envisaged a second phase to assess an inventory of the energy technologies which would move Canada toward energy sustainability. Unfortunately the necessary financial support has not been forthcoming.

At the CAETS meeting in Beijing in October 2000 President Bouchard proposed that a worldwide collaborative study of energy supply and demand be instituted. Ten CAETS members agreed to explore such a collaboration. Subsequently, it was decided not to proceed within CAETS on this study.

WOMEN IN ENGINEERING

The issue of Women in Engineering has been championed by 2000 President Micheline Bouchard and by other women Fellows of the Academy. The National Conference for the Advancement of Women in Engineering Science and Technology was held in St. John's Nfld. in July 2000 with Fellow Kathleen Sendall as the featured speaker.

In 1997 NAE developed a *Diversity in Engineering* program and a website called *Celebration of Women in Engineering*. V. Friedensen of NAE met with the Development and Implementation Committee in September 2000 and offered to assist CAE in establishing a Canadian 'sister site'. It was recognized that close cooperation was needed with the CCPE project on Women in Engineering. Fellow Elizabeth Cannon who was also a CCPE committee member agreed to coordinate these efforts. She later reported on the CCPE program with its strong emphasis on mentoring and concluded that no special CAE initiative was necessary. The academy continues a watching brief.

Women in Engineering: Expanding the Possibilities was the theme of the 2000 annual meeting in Toronto organized by President-Elect Micheline Bouchard and assisted by Fellows Elizabeth Cannon, Monique Frize and Kathleen Sendall. Fellow Julie Payette was the luncheon speaker.

In 2002 Canada hosted the 12th *International Conference of Women Engineers and Scientists* in Ottawa chaired by Fellow Monique Frize. At this conference symposia were held on Climate Change and on Ethics and Science. Fellow Julie Payette was the banquet speaker. There were 550 participants from 44 countries.

To conclude this section, it may be noted that Fellow Micheline Bouchard was not only the first woman president of CAE, but also the first woman to hold that office in any of the academies represented within CAETS.

INTERNATIONAL LINKAGES

In 1978 the academies of engineering of Australia, Mexico, Sweden, the United Kingdom and the United States of America created an informal convocation which by 1985 was known as the international *Council of Academies of Engineering and Technological Sciences (CAETS)*. The mission of this Council included providing an international forum for discussion and communication of engineering issues, and promoting sustainable economic growth and social welfare throughout the world. Soon after its own inauguration CAE applied for membership.

In March 1988 the first function in the visit to Canada of King Gustav of Sweden was a Symposium on *Industrial Progress through Science and Technology*. This event, held in the Ottawa auditorium of the Department of External Affairs, was co-sponsored by the Royal Swedish Academy of Engineering, the world's senior engineering academy, and CAE, the academy most recently formed.

CAETS holds a Convocation every two years. CAE President Lapp was invited to attend the 1988 Convocation in Australia as an observer. In addition to the five founding members of CAETS, there were representatives of China, France, Norway, Hungary, Switzerland, Finland, Thailand, Japan, and Belgium, most expressing a wish to join. CAE formally joined in 1991.

Each convocation has a major theme, examples being Management of Technological Change, Globalization of Technology, Sustainable Development, Technology and Health and the World's Forests. At each Council meeting applications for membership from new countries are reviewed. CAETS actively assists each national group wishing to form a new engineering academy with appropriate structure and standards.

Usually the current CAE president has attended the biennial Convocations and also the Council meetings which are held in alternate years. President Dagenais and President-Elect Davenport attended the 1992 Convocation in Copenhagen which focused on environmental issues, risk and energy policy. At that date CAETS included 13 academies. Davenport was at the Council meeting in Irvine in January 1993. President Gourdeau attended the Helsinki Convocation in 1994 as did Bruneau in 1995 in Sweden, Dinsmore at Edinburgh in 1997, Slemon in Sophia-Antipolis, France in 1999 and Wright in Espoo, Finland in 2001. Micheline Bouchard and Alex Taylor attended the CAETS Council meeting in Beijing in October 2001 at which time the CAETS membership had risen to 25.

The 1998 CAETS Council meeting was held in Ottawa coincident with the CAE annual meeting. The 23 international guests took part in the CAE program and were entertained by the CAE Board Members to dinner at Cercle Universitaire. During the next day's meeting of CAETS, the Polish and Ukrainian academies were admitted bringing the total to 22 with 8 more under consideration. In 1996 CAE joined 13 other academies in a published declaration on *The Role of Technology in Environmentally Sustainable Development*.

Concerns raised at its 1995 Convocation over a reduction in enrolment of engineering students in Europe prompted CAETS to form a Working Party on Engineering Education. The Party included representatives of the academies in Australia, Canada, Denmark, France, Japan, Norway, the Netherlands, UK and USA with Gordon Slemon delegated by CAE. Their report published in May 1999 included valuable information on national trends, established that declining interest in engineering was confined to only a few European countries, but concluded that the quality issue was worldwide.

At the 13th CAETS Convocation in France in 1999, CAE President Slemon introduced for discussion the issue of the national visibility and prestige of engineering academies. While the concern was shared, no follow-up action was taken. The 18th Convocation is planned for Canada in 2009.

Early in its history CAE explored the feasibility of becoming the official representative of Canada on several international bodies such as the *World Federation of Engineering Organizations (WFEO)* and the *Pan American Federation of Engineering Societies (UPADI)*. CAE has not pursued this matter as it has not had a source of the necessary membership dues.

In 1992 CAE President Alan Davenport met with representatives of the Academies of Engineering of Mexico and USA to discuss issues of mutual interest that might arise as a result of the forthcoming NAFTA Agreement. These included mobility and standards, environment, research and distance education. An agreement of cooperation and collaboration was signed and the joint services of all three academies was offered to the three governments regarding implementation and dispute settlement under NAFTA.

In November 1993 CAE President Gordon MacNabb and President-Elect Jean-Paul Gourdeau attended the Joint Workshop on US-Mexican-Canadian Environmental Issues in the context of NAFTA, some travel funding having been provided by the Department of Industry. On the occasions of CAETS Convocations since 1995, the Canadian, Mexican and United States

representatives have set up meetings to continue discussions related to the NAFTA agreement. No major initiatives have followed from these discussions.

In 1999 CAE was invited to the Celebration on the Sixth Cycle of His Majesty The King of Thailand and the 40th Year Anniversary of the Asian Institute of Technology. President Alex Taylor attended and delivered a major lecture on Engineering in Canada.

Frontiers of Engineering (FOE) is an annual symposium operated by NAE bringing together about 125 of America's leading young engineers to learn and to share ideas. NAE invited Canada and Mexico, its partners in NAFTA, to participate. In 2000, Past-President Slemon and a young Motorola engineer were sent by CAE to take part in the 3-day meeting in California. They reported favourably and Canadian participation in FOE continues periodically at a relatively low level.

Considering its relative youth and limited resources, the Academy has made good efforts to carry out its objective "to cooperate with other national Academies and international bodies on matters of mutual interest".

REGIONAL ACTIVITIES

Most of the activity of the Academy has been centred around its Ottawa office with occasional meetings of its Board and Executive in Montreal or Toronto. For convenience, most of the meetings of the Development and Implementation Committee have been held in or near Toronto. Lack of travel funds has deterred direct participation by Fellows from much of Canada.

Sporadic efforts have been made by several presidents to set up regional meetings. In 1992 President Davenport met with local Fellows in Vancouver, Calgary and Toronto. President Bruneau arranged meetings in Edmonton, Calgary and Vancouver in 1996. In 1998 President Slemon met with CAE groups in Winnipeg, Edmonton, Calgary and Vancouver. In all of these meetings there was strong interest in a greater local presence of the academy to expand participation but no workable mechanisms were proposed.

The Academy took action in 1998 to appoint Regional Coordinators in most of the provincial capitals. The roles of these local representatives were:

- to provide liaison with provincial governments, ministers and officials;
- to provide liaison with provincial professional engineering associations;

- to convene meetings of local Fellows; and
- to generate appropriate nominations for Fellowship.

Those appointed as Regional Coordinators were: Martha Salcudean (BC), Fred Otto (AB), Wayne Clifton (SK), Edmund Kuffel (MB), Douglas Wright (ON), François Tavenas (QC), Frank Wilson (NB), Leslie Jaeger (NS) and Angus Bruneau (NF).

These Regional Coordinators have been called on to assist in the implementation of the recommendations of several of the Academy's reports, particularly those on Engineering Education, Lifelong Learning and Protecting the Public.

CONCLUSION

A 15-year review of its history provides an opportunity to assess the success so far of the Academy in fulfilling the six primary objects set out in its letters patent.

1. The first object was “to provide means of anticipating and assessing the changing needs of Canada and the technical resources that can be and should be applied to them, and to sponsor programs aimed at meeting these needs”. The Academy has independently initiated major studies in a number of areas. It has drawn on the expertise of its volunteer members and has produced eight reports. While a majority of these reports have been directed at the beneficial development of the engineering profession, a few have addressed areas of direct importance to the nation. The resources of the Academy have not been such as to permit sponsoring programs of direct implementation, but the approach of CAE has been to recommend implementation to those having specific responsibility.

2. The Academy has on several occasions “provided independent and expert advice on matters of national importance pertinent to engineering” to governments, universities, engineering organizations and the public. It has not yet established itself as the prime and accepted source of such advice to the federal government on engineering matters. It is hoped that this can be better achieved through the framework of the proposed *Canadian Academies of Science*.

3. The Academy has “recognized outstanding contributions to society and to the country by leading Canadian engineers and to highlight exceptional engineering achievements” primarily by the appointment of an illustrious group of Fellows. Considering its limited resources it has not been able to establish the desired wide public awareness of the FCAE recognition and has chosen so far not to establish

an independent set of awards and prizes.

4. The Academy has worked carefully and conscientiously “to complement the role and functions of existing national engineering organizations”. Its chosen role has been to provide leadership and advice in matters of general policy for the engineering profession and to leave implementation of these policies to others. It has cooperated successfully with the Royal Society of Canada on a number of important issues and, not without some difficulties, has established itself as a parallel rather than a subsidiary academy.

5. By joining the Council of Academies of Engineering and Technological Sciences (CAETS), the Academy has established a good and workable link to the international engineering scene. That body has the potential, still largely unrealised, to have a major impact on world-level issues and the Academy has attempted to promote appropriate action. The Academy has not been involved with other international engineering bodies.

6. The success of the Academy in “to serving the nation in connection with significant challenges involving engineering and technology” has to be assessed in relation to its very limited financial resources. It has great potential in the wisdom, experience and insight of its Fellows, but a more fully supported infrastructure is essential to tap this capability effectively.

PRESIDENTS OF THE ACADEMY

1987	Robert Legget (deceased)
1988	Philip Lapp
1989	Larkin Kerwin
1990	James Ham (deceased)
1991	Camille Dagenais
1992	Alan Davenport
1993	Gordon MacNabb
1994	Jean-Paul Gourdeau
1995	Angus Bruneau
1996	Angus Bruneau
1997	John Dinsmore
1998	Gordon Slemon
1999	Alex Taylor
2000	Micheline Bouchard
2001	Joseph Wright
2002	Claude Lajeunesse

DIRECTORS OF THE ACADEMY – 1988-2002

Morrel Bachynski – 1999-2002, President, MPB Technologies Inc.
Douglas Barber – 2002, President & CEO, Gennum Corp.
Clifford Baronet – 1994-1995, Vice-President, National Research Council
Leonard Bolger – 1997, Chairman, Advatech Homes Canada Inc.
Micheline Bouchard – 1994-2001, Chairman, President & CEO, Motorola Canada Ltd.
Angus Bruneau – 1991-1998, Chairman, President & CEO, Fortis Inc.
Walter Curlook – 1992-1993, Vice-Chairman, INCO Ltd.
Camille Dagenais – 1988-1992, Chairman, President & CEO, Groupe SNC Inc.
Alan Davenport – 1988-1993, Professor & Director, Boundary Layer Wind Tunnel, University of Western Ontario
John Dinsmore – 1990-1998, President, Forum Enterprises universités
Roland Doré – 1994, President, Canadian Space Agency
Earl Dudgeon – 1991-1995, Vice-President, National Research Council
Pierre Fortier – 1999-2000, Chairman, Innovitech Inc.
Monique Frize – 2000-2001, Professor and NSERC Chair, Carleton University
William Gauvin – 1988-1989, Director of Research, Noranda Mines
Toby Gilsig – 1999-2001, CEO, JED International Inc.
Jean-Paul Gourdeau – 1992-1996, President & Principal, Ecole Polytechnique
James Ham – 1988-1991, President, University of Toronto
Carolyn Hansson – 2002, Professor of Materials Engineering, University of Waterloo
Gerald Heffernan – 1993-1994, President, G.R. Heffernan & Assoc.
Arthur Heidebrecht – 2000-2002, Vice-President and Provost, McMaster University
Michael Isaacson – 1999-2001, Dean of Applied Science, University of British Columbia
Hector Jacques – 1999-2000, Chairman & CEO, Jacques Whitford Group Ltd.
Larkin Kerwin – 1988-1990, President, National Research Council
Egerton King – 1990-1991, CEO, Canadian Utilities Ltd
Lesmere Kirkpatrick – 1990-1991, President & CEO, Nova Scotia Power
Claude Lajeunesse – 1995-2002, President, Ryerson University
Bernard Lamarre – 1989-1991, Chairman, Lavalin Inc.
Philip Lapp – 1988-1989, President, Philip A. Lapp, Ltd.
Colin Latham – 2001-2002, President & CEO, Maritime T&T
Robert Legget – 1988- 1989, Director of Building Research, National Research Council
Walter Light – 1988-1991, Chairman, President & CEO, Northern Telecom Ltd,
Garry Lindberg – 2001-2002, Vice-President, Canadian Space Agency

John Lockyer – 1998-1999, Vice-President, Spar Aerospace Ltd.
John S. MacDonald – 1988-1991, Chairman & President, MacDonald, Detwiler
& Assoc.
John MacLeod – 1994-1995, President & CEO, Shell Canada Ltd.
Gordon MacNabb – 1991-1994, President, Natural Sciences and Engineering
Research Council.
Gerald J. Maier – 1993-1995, Chairman, President & CEO, TransCanada
PipeLines
John McDougall – 1992, 2002, President & CEO, Alberta Research Council
Leslie McLean – 1996, Vice-President and Chief Engineer, Stelco Inc.
Axel Meisen – 1996-1999, President, Memorial University
Eric Newell – 1998-1999, Chairman & CEO, Syncrude Canada Inc.
Ronald Nolan – 2002, Chairman & CEO, Hatch Associates
Edward Rhodes – 1997-1998, President, Technical University of Nova Scotia
Robert Savage – 1996-1997, President & COO, UMA Group Ltd
Kathleen Sendall – 2001-2002, Vice-President, Petro-Canada
Francois Sénécal-Tremblay – 1993, President, Alcan Smelters
Leslie Shemilt – 1988-1991, Professor of Chemical Engineering, McMaster
University
Thomas Simons – 2000-2002, Chairman & CEO, Simons International Corp.
Gordon Slemon – 1991-1999, Dean, Applied Science and Engineering, University
of Toronto
Alex Taylor – 1995-2000, Chairman, President & CEO, AGRA Industries Ltd.
Michèle Thibodeau-DeGuire – 1992-1993, President & CEO, Centraide Montreal
Frank Wilson – 1996-1998, Vice-President, University of New Brunswick
Harold Wright – 1992, Chairman, Wright Engineers Ltd.
Joseph Wright – 1995-2002, President & CEO, Paprican